

# State of Wyoming Retirement System – Public Employee Plan

Actuarial Valuation Report  
for the Year Beginning January 1, 2020





May 29, 2020

Board of Trustees  
State of Wyoming Retirement System  
6101 Yellowstone Road  
Suite 500  
Cheyenne, WY 82002

Dear Board of Trustees:

**Subject: Actuarial Valuation as of January 1, 2020**

We are pleased to present the report of the actuarial valuation of the Public Employee Plan of the State of Wyoming Retirement System ("the Fund") for the plan year commencing January 1, 2020. This report describes the current actuarial condition of the Fund, determines the calculated employer contribution rate (the actuarially determined contribution rate), and analyzes changes in this contribution rate from the prior year. Valuations are prepared annually, as of January 1, the first day of the Fund's plan year.

This report was prepared at the request of the Board and is intended for use by the Retirement System and those designated or approved by the Board. This report may be provided to parties other than the System only in its entirety and only with the permission of the Board. GRS is not responsible for unauthorized use of this report.

#### **Financing objectives and Funding Policy**

The employer and employee contribution rates are specified in the statute. The purposes of the valuation are to measure the System's funding progress and to determine whether or not the statutory contribution is sufficient to meet the obligations of the Fund. This report should not be relied on for any purpose other than the purposes described herein. Determinations of financial results, associated with the benefits described in this report, for purposes other than those identified above may be significantly different.

This valuation assumed the continuing ability of the plan sponsor to make the contributions necessary to fund this plan. A determination regarding whether or not the plan sponsor is actually able to do so is outside our scope of expertise and was not performed.

### **Progress toward realization of financing objectives**

The funded ratio (the ratio of the actuarial value of assets to the actuarial accrued liability) is a standard measure of a plan's funded status. The funded ratio, based upon the assumption of no further cost-of-living adjustment increases as of January 1, 2020 is 73.16%. In the January 1, 2019 valuation, this funded ratio was 74.15%. On a market value of assets basis, the funded ratio increased from 69.22% as of January 1, 2019 to 76.41% as of January 1, 2020. The funded status alone is not appropriate for assessing the need for future contributions. The funded status is also not appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations.

### **Benefit Provisions**

The benefit provisions reflected in this valuation are those, which were in effect on January 1, 2020, including recent legislation that affects benefits for members who join the State of Wyoming Retirement System later than August 31, 2012. W.S. 9-3-454 prohibits benefit changes, including cost-of-living increases, unless the funded ratio stays above 100% plus a margin for adverse experience throughout the life of the benefit change. Therefore, this valuation does not include any liability for future cost-of-living increases.

The benefit provisions are summarized in Appendix B of the report.

### **Assumptions and Methods**

Actuarial assumptions and methods are set by the Board, based upon recommendations made by the plan's actuary. The current assumptions used in the actuarial valuation were adopted by the Board effective August 23, 2017 and were first utilized with the January 1, 2018 valuation report. For a detailed description of the experience related to these assumptions, as well as the rationale for any changes, please see our latest Wyoming Retirement System Actuarial Experience Study Report. Our experience study report was dated January 10, 2018 and it covered the five-year investigation period ending December 31, 2016. All actuarial assumptions used in this report are reasonable for the purposes of this valuation.

The results of the actuarial valuation are dependent upon the actuarial assumptions used. Actual results can and almost certainly will differ, as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rates and funding periods. The actuarial calculations presented in the report are intended to provide information for rational decision making.



### **Assumptions and Methods (continued)**

The 8.75% employee contribution and the 8.87% employer contribution are the current rates that comply with State law. Both employee and employer contribution rates will increase each year until July 1, 2021, when an ultimate rate of 9.25% for employees and 9.37% for employers is reached. Due to the many factors affecting a retirement system, users of this report should be aware that contributions made at that rate do not necessarily guarantee long-term benefit security.

The employer contribution requirement in Table 1 of this report is determined using the actuarial assumptions and methods disclosed in Appendix A of this report. This report includes risk metrics in Appendix C but does not include a more robust assessment of the risks of future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment. We encourage a review and assessment of investment and other significant risks that may have a material effect on the plan's financial condition.

All assumptions and methods are described in Appendix A of our report.

### **Data**

Member data for retired, active and inactive members was supplied as of January 1, 2020 by the System's staff. We did not audit this data, but we did apply a number of tests to the data, and we concluded that it was reasonable and consistent with the prior year's data.

Asset and financial information as of January 1, 2020 was prepared by the Wyoming Retirement System and is the responsibility of management. Eide Bailly, LLP provided us the asset and financial information and will opine on Wyoming Retirement System's statements.

We are not responsible for the accuracy or completeness of the information provided by the System's staff.

### **Plan Experience**

As part of each valuation, we examine the Fund's experience relative to the assumptions. As experience in a given year deviates from the assumptions, a gain occurs if the liabilities grow slower than the assumption set anticipates and a loss occurs if the liabilities grow faster. This past fiscal year, the Fund had a total experience loss of approximately \$172 million, composed of a \$69 million investment loss, a \$47 million contribution loss, and a \$56 million liability loss. The aggregate results of these analyses are disclosed in Tables 4 and 5 under Section III of the report.



### **Actuarial Certification**

All of the tables contained in this actuarial valuation report were prepared by Gabriel, Roeder, Smith & Company. Historical information for years prior to 2010 was prepared by the prior actuarial firm and was not subjected to our actuarial review.

We certify that the information presented herein is accurate and fairly portrays the actuarial position of the System as of January 1, 2020.

All of our work conforms with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board. In our opinion, our calculations also comply with the requirements of state law and, where applicable, the Internal Revenue Code and ERISA.

The undersigned are independent actuaries and consultants.

Mark Randall and Thomas Lyle are Enrolled Actuaries and Mark Randall, Paul Wood, and Thomas Lyle are Members of the American Academy of Actuaries, and all three meet all the Qualification Standards of the American Academy of Actuaries.

Finally, all of the undersigned are experienced in performing valuations for large public retirement systems.

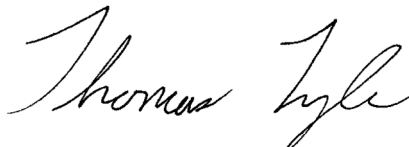
Respectfully submitted,  
**Gabriel, Roeder, Smith & Company**



Mark R. Randall, FCA, EA, MAAA  
Chief Executive Officer



Paul T. Wood, ASA, FCA, MAAA  
Consultant



Thomas A. Lyle, ASA, FCA, EA, MAAA  
Senior Analyst



# Table of Contents

## Page

### **Section I — Executive Summary**

Executive Summary .....	2
-------------------------	---

### **Section II — Discussion**

Contribution Requirements .....	4
Calculation of Contribution Rates.....	5
Financial Data and Experience .....	6
Member Data.....	7
Benefit Provisions .....	8
Actuarial Methods and Assumptions.....	9
GASB and Funding Progress.....	10

### **Section III — Supporting Exhibits**

Table 1a - Calculation of Employer Contribution Rate .....	12
Table 1b -Calculation of UAAL Amortization Payment.....	13
Table 2 - Cost Breakdown .....	14
Table 3 - History of Total Normal Cost .....	15
Table 4 - Calculation of Total Actuarial Gain/(Loss) .....	16
Table 5 - Change in Calculated Contribution Rate Since the Prior Valuation.....	17
Table 6 - Statement of Plan Net Assets .....	18
Table 7 - Reconciliation of Plan Net Assets .....	19
Table 8 - Progress of Fund Through December 31, 2019 .....	20
Table 9 - Development of Actuarial Value of Assets .....	21
Table 10 - History of Investment Returns.....	22
Table 11 - Solvency Test .....	23
Table 12 - Schedule of Funding Progress.....	24
Table 13 - Schedule of Contributions from the Employer(s) and Other Contributing Entities .....	25
Table 14 - Reconciliation of Participant Data .....	26
Table 15 - Demographic Statistics .....	27
Table 16 - Distribution of Male Active Members by Age and by Years of Service .....	28



## Table of Contents

Table 17	- Distribution of Female Active Members by Age and by Years of Service.....	29
Table 18	- Distribution of Total Active Members by Age and by Years of Service .....	30
Table 19	- Distribution of Male Deferred Members by Age and by Years of Service.....	31
Table 20	- Distribution of Female Deferred Members by Age and by Years of Service .....	32
Table 21	- Distribution of Total Deferred Members by Age and by Years of Service.....	33
Table 22	- Schedule of Pension Recipients Added to and Removed from Rolls.....	34
Table 23	- Retired and Disabled Members by Option Code .....	35
Table 24	- Pensioners by Monthly Benefit and Option Code .....	36
Table 25	- Pensioners by Age and Option Code .....	37
Table 26	- Pensions Awarded in 2019 by Option Code .....	38
Table 27	- Retirees and Disabled Members by Service at Retirement and Years Since Retirement	39
Table 28	- Retirees and Disabled Members by Year of Retirement .....	40
Table 29	- Thirty Year Projected Benefit Payments.....	41
<b>Appendix A</b>	<b>— Summary of Actuarial Assumptions and Methods.....</b>	<b>43-47</b>
<b>Appendix B</b>	<b>— Summary of Plan Provisions .....</b>	<b>49-51</b>
<b>Appendix C</b>	<b>— Risks Associated with Measuring the Accrued Liability .....</b>	<b>53-55</b>



## SECTION I

---

### EXECUTIVE SUMMARY



## Executive Summary

Item	January 1, 2020	January 1, 2019
	No COLA	No COLA
1. Contributions:		
a. Total normal cost	10.870%	10.910%
b. Employee contributions*	(8.875%)	(8.625%)
c. Net employer normal cost	1.995%	2.285%
d. Amortization payment	9.670%	8.950%
e. Administrative expenses	0.390%	0.400%
f. Required contribution	12.055%	11.635%
g. Statutory contribution*	(8.995%)	(8.745%)
h. Shortfall/(surplus)	3.060%	2.890%
2. Funding Elements:		
a. Market value of assets (MVA)	\$7,790,558,842	\$6,831,368,597
b. Actuarial value of assets (AVA)	\$7,459,695,656	\$7,318,379,669
c. Actuarial accrued liability (AAL)	\$10,196,045,970	\$9,869,615,224
d. Unfunded/(overfunded) actuarial accrued liability	\$2,736,350,314	\$2,551,235,555
3. Contributions and Ratios:		
a. Annual required contribution	\$219,815,919	\$207,518,684
b. Actual contributions	N/A	157,385,096
i. Employer	N/A	155,456,957
ii. Other	N/A	1,928,139
c. Percentage contributed	N/A	75.84%
d. Funded ratio on an actuarial basis (AVA/AAL)	73.16%	74.15%
e. Funded ratio on a market basis (MVA/AAL)	76.41%	69.22%
f. Projected payroll	\$1,824,979,015	\$1,781,668,069

\*The contribution rates are blended based on Enrolled Act No. 65. Both employee and employer contribution rates will increase each year until July 1, 2021 when an ultimate rate of 9.25% for employees and 9.37% for employers is reached.

# SECTION II

---

## DISCUSSION

## Contribution Requirements

- Exhibits throughout this report are based primarily, unless stated otherwise, on the assumption of no future cost-of-living adjustments (COLAs).
- W.S. 9-3-454 prohibits benefit changes, including cost-of-living increases, unless the funded ratio stays above 100% plus a margin for adverse experience throughout the life of the benefit change. The actuarial value funded ratio is 73.16% and the market value funded ratio is 76.41%.
- The actuarial assumptions have not changed since the prior valuation. For a detailed description of the experience related to these assumptions, as well as the rationale for any changes, please see our latest Wyoming Retirement System Actuarial Experience Study Report.
- The amortization payment is based upon the following assumptions:
  - The funding period is based on a 30-year closed period for the initial base as of January 1, 2018 and 20-year closed period layers for future gains and losses
  - Amortization payment amounts are calculated in such a way that they will increase as a level percentage of payroll
  - Total payroll increases are assumed at 2.50% per year, and
  - Future growth in the number of active members is not reflected in the annual valuation
- The analysis of the changes in the contribution rates is shown in Table 5 under Section III of the report
- Pursuant to recently passed legislation, both employee and employer contribution rates will increase each year until July 1, 2021 when an ultimate rate of 9.25% for employees and 9.37% for employers is reached.
- The calculated funding period assuming the new contribution rates is 29 years. In the January 1, 2019 valuation, the funding period was 56 years. Projection results were produced under a separate cover.
- Absent negative plan experience, the plan is projected to be fully funded within the next 30 years.
  - At the time this report is being issued, we are living through the global COVID-19 pandemic. As a result, the financial markets are significantly down and experiencing extreme volatility. A discussion of possible impacts of the pandemic will be provided outside of this report.

## Calculation of Contribution Rates

The funds available to pay benefits come from two sources, contributions and investment income on those contributions (the majority of the funds available to pay benefits typically come from investment income). The Fund receives contributions from two sources, employer contributions and member contributions, both of which are determined as a percentage of pay. As shown in Table 1 under Section III of the report, the employer contribution rate has three components:

- The normal cost percentage (NC%)
- The amortization percentage (UAAL%)
- The administrative expenses

The NC% is the theoretical amount which would be required to pay the members' benefits if this amount had been contributed from each member's entry date and if the fund's experience exactly followed the actuarial assumptions. The NC% is shown in Table 3 under Section III of the report.

Members are required to make employee contributions and only the excess of the NC% over the member contribution rate is included in the employer contribution rate.

The actuarial accrued liability (AAL) is the difference between (i) the actuarial present value of all future benefits for all current participants of the fund, including active, inactive and retired members, and (ii) the actuarial present value of future normal costs. Thus, the AAL represents the liability associated with past years. The unfunded actuarial accrued liability (UAAL) is the difference between the AAL and the actuarial value of assets (AVA). It is the shortfall/excess between the liability associated with prior years (the AAL) and the assets actually accumulated (the AVA). This shortfall/excess can arise from several sources, including actuarial gains and losses, which are caused by differences between actual experience and the plan's assumptions, changes to the plan's actuarial assumptions, and amendments to the benefit provisions.

The UAAL% is the amount required to fund this difference. It is the amount, expressed as a level percentage of payroll, necessary to amortize the UAAL. Amortization bases are established each year and amortized based on the Board's policy. The Board's policy consists of amortizing the unfunded liability as of January 1, 2018, over a closed 30 year period with each subsequent amortization base created as a result of year to year experience changes over individual 20 year closed periods. The Executive Summary shows the UAAL%, called Amortization Payment, compared to that of last year.

Assumed administrative expenses are the average of the prior two years, with each year projected at 2.5% to the valuation date.

The calculated rate is used in determining the contributions necessary to meet the Actuarially Determined Contribution for the twelve-month period beginning January 1, 2020. As of January 1, 2020, the employer contribution is within 3.06% of meeting the Actuarially Determined Contribution. The current shortfall in contribution is expected to persist for years to come.

## Financial Data and Experience

As of January 1, 2020, the Fund has a total market value of \$7,791 million. Financial information was received from Eide Bailly, LLP.

Table 7 under Section III of the report shows a reconciliation of the market values between the beginning and end of 2019.

During 2019, the total investment return on the market value of assets (MVA), as reported by Meketa Investment Group, Inc., was 18.72%, as shown in Table 10 under Section III of the report.

In determining the contribution rates and funded status of the Fund, an actuarial value of assets (AVA) is used rather than the market value of assets. The actuarial value of assets is based on the market value of assets with a five-year phase-in of actual investment return in excess of (or less than) expected investment income. Expected investment income is determined using the assumed investment return rate and the market value of assets (adjusted for receipts and disbursements during the year). The returns are computed net of investment expenses. An adjustment is made if the actuarial value is not within 20% of the Market Value. For any year following a year in which the 20% of market value adjustment was applied, the actuarial value is determined as if the adjustment was not applied in the previous year.

The development of the AVA is shown in Table 9 under Section III of the report. The AVA is \$7.5 billion. The AVA is 95.75% of the MVA as of December 31, 2019, compared to 107.13% last year. The difference between the AVA and the MVA is the deferred gains and losses. As of January 1, 2019, the total deferred loss was \$487 million. As of January 1, 2020, the total deferred gain was \$331 million. Having a deferred gain in the AVA is an indicator that the funded ratio will have an upward “tilt” in the near term, and contribution requirements will likewise have downward pressure.

In addition to the market return, Table 10 also shows the return on the actuarial value of assets for the Fund. For 2019, this return was 6.05%. Since this return is less than the assumed 7.00% investment return for the prior year, an actuarial loss occurred increasing the unfunded actuarial accrued liabilities of the Fund by \$68.9 million.

## Member Data

Member data as of January 1, 2020 was supplied electronically by the Fund's staff. While we did not audit this data, we did perform various tests to ensure that it was internally consistent, consistent with the prior year's data, and was reasonable overall.

Table 15 under Section III of the report shows the number of members by category (active, inactive, retired, etc.) along with member statistics. Tables 16 through 28 show summaries of certain historical data and include membership statistics.

Total active member payroll increased 2.43% last year, compared to a decrease of 0.18% from the prior year.

The number of active members in Tier 1 decreased, from 19,518 to 17,845. There were 1,070 members who retired out of Tier 1, compared to 1,146 who retired out of Tier 1 last year.

Of the 35,206 active participants, 6,099 are eligible or will become eligible for unreduced retirement and 7,118 are eligible or will become eligible for reduced retirement in 2020.

The average of the final average salaries for participants who retired or became disabled this year is \$52,289.

Changes in payroll are significant because the methodology used in the valuation to amortize the unfunded actuarial accrued liability assumes a growing payroll into the future. If the payroll does not grow at the assumed 2.50% per year average, then the current amortization payments may be understated and the funding position of the Fund will not strengthen as assumed over time. Higher than expected payroll growth, however, has the opposite effect of this and the funded position of the Fund should trend toward 100%. Table 5 under Section III of the report shows, for the past year, payroll for the plan increased less than expected so the effect is an increase in the calculated contribution rate of 0.01% of payroll.

One reason payroll increased less than expected is that the salary, for continuing active participants, increased less than expected. This represented a gain to the Plan, as shown in Table 4 under Section III of the report.

## Benefit Provisions

Appendix B of the report includes a more detailed summary of the benefit provisions for the Fund. A brief summary is as follows:

A new tier of benefits was signed into law on March 23, 2012 and is effective for new members joining the System on or after September 1, 2012.

- *Tier*
  - Members who join the State of Wyoming Retirement System by August 31, 2012 are in Tier 1, while members who join later are in Tier 2
- *Normal Retirement Eligibility*
  - For Tier 1 member - Age 60 with at least four years of service
  - For Tier 2 member - Age 65 with at least four years of service
- *Normal Retirement Benefit*
  - For Tier 1 member - 2.125% of employee's Highest Average Salary for each year of credited service for the first 15 years of service credit plus 2.25% of Highest Average Salary for any years of service credit exceeding 15 years. This amount is reduced by 5.0% per year that the employee is under age 60.
  - For Tier 2 member - 2.00% of employee's Highest Average Salary for each year of credited service. This amount is reduced by 5.0% per year that the employee is under age 65.

However, members retiring with a combined age and service of at least 85 receive an unreduced benefit. Employees hired prior to July 1, 1981 may be entitled to benefits earned under a different formula.
- *Normal Form of Payment*
  - Monthly benefit for life with a lump-sum death benefit equal to the excess (if any) of the employee contributions with interest over the total benefits received.
- *Employee Contributions* are required
  - 8.75% of pay.
- *Post-retirement Cost-of-Living Adjustments (COLAs)*
  - W.S. 9-3-454 prohibits benefit changes, including cost-of-living increases, unless the funded ratio stays above 100% plus a margin for adverse experience throughout the life of the benefit change.

Pursuant to Enrolled Act No. 65, the contributions will increase for the both the employee and employer 0.25% per year for the next two years.

## Actuarial Methods and Assumptions

Appendix A of the report includes a summary of the actuarial assumptions and methods used in this valuation. A few highlights are listed as follows:

- Costs are determined using the Entry Age Normal actuarial cost method, calculated as a level percentage of payroll.
- The unfunded actuarial accrued liability is amortized over an effective 27 year closed period as a level percent of payroll. Future valuations will include additional amortization layers on a closed 20 year bases.
- The assumed annual investment return rate is 7.00%, with assumed inflation of 2.25%.
- Payroll is assumed to increase at 2.50% per year.
- Inactive vested participants are assumed to retire at age 60 (65 for Tier 2) or on the valuation date if older.
- The benefit amount is not available for all members entitled to deferred benefits. The benefit amount and present value of benefits expected to be paid to vested inactive non-retired members without a benefit in the data is approximated using the data provided.

The average future lifetime for current pensioners is 15.9 years.

The actuarial assumptions and methods were reviewed in detail as part of the 2017 Experience Study covering the five year period ending December 31, 2016. Please see Appendix A for a summary of these assumptions.



## **GASB and Funding Progress**

Governmental Accounting Standards Board Statement Number 67 (GASB 67) contains certain accounting requirements for the Fund. Schedules, notes and required supplementary information are provided under separate cover.

## **SECTION III**

---

### **SUPPORTING EXHIBITS**

# Table 1A

## Calculation of Employer Contribution Rate (Assumes No Future Cost-Of-Living Increases)

Item	January 1, 2020	January 1, 2019
1. Projected valuation payroll	\$1,824,979,015	\$1,781,668,069
2. Present value of future pay	\$14,781,544,687	\$14,394,639,697
3. Employer normal cost rate	2.00%	2.29%
4. Actuarial accrued liability for active members		
a. Present value of future benefits for active members	\$5,091,704,649	\$5,060,062,785
b. Less: present value of future employer normal costs	(186,411,157)	(198,557,378)
c. Less: present value of future employee contributions*	(1,359,014,321)	(1,313,958,918)
d. Actuarial accrued liability	\$3,546,279,171	\$3,547,546,489
5. Total actuarial accrued liability for:		
a. Retirees and beneficiaries	\$6,132,779,279	\$5,829,718,015
b. Disabled members	38,472,772	38,523,845
c. Inactive members	478,514,748	453,826,875
d. Active members (Item 4d)	3,546,279,171	3,547,546,489
e. Total	\$10,196,045,970	\$9,869,615,224
6. Actuarial value of assets (Table 9)	\$7,459,695,656	\$7,318,379,669
7. Unfunded actuarial accrued liability (UAAL) (Item 5e - Item 6)	\$2,736,350,314	\$2,551,235,555
8. Effective UAAL amortization period	27 years	28 years
9. Assumed payroll growth rate	2.50%	2.50%
10. Employer contribution requirement		
a. UAAL amortization payment as % of pay	9.67%	8.95%
b. Employer normal cost	2.00%	2.29%
c. Administrative expense	0.39%	0.40%
d. Contribution requirement (a + b + c)	12.06%	11.64%

\*Includes the anticipated employee increases under Enrolled Act No. 65.

## Table 1B

### Calculation of UAAL Amortization Payment (Assumes No Future Cost-Of-Living Increases)

UAAL as of January 1, 2020				\$2,736,350,314
Total Prior Remaining Amortization Bases as of January 1, 2020				2,564,798,939
<b>2020 Amortization Base as of January 1, 2020</b>				<b>\$171,551,375</b>
<b>2020 Payment (20 years, level percent of pay amortization)</b>				<b>\$12,944,270</b>
		<b>As of January 1, 2020</b>		
<b>Base Year</b>	<b>Initial Base</b>	<b>Remaining Base</b>	<b>Years Remaining</b>	<b>Amortization Payment</b>
2020	\$ 171,551,375	\$ 171,551,375	20	\$ 12,944,270
2019	259,338,420	257,250,636	19	20,057,375
2018	2,273,969,633	2,307,548,303	28	143,464,828
<b>Total</b>		<b>\$ 2,736,350,314</b>		<b>\$ 176,466,473</b>

**Table 2**  
**Cost Breakdown**  
**(Assumes No Future Cost-Of-Living Increases)**

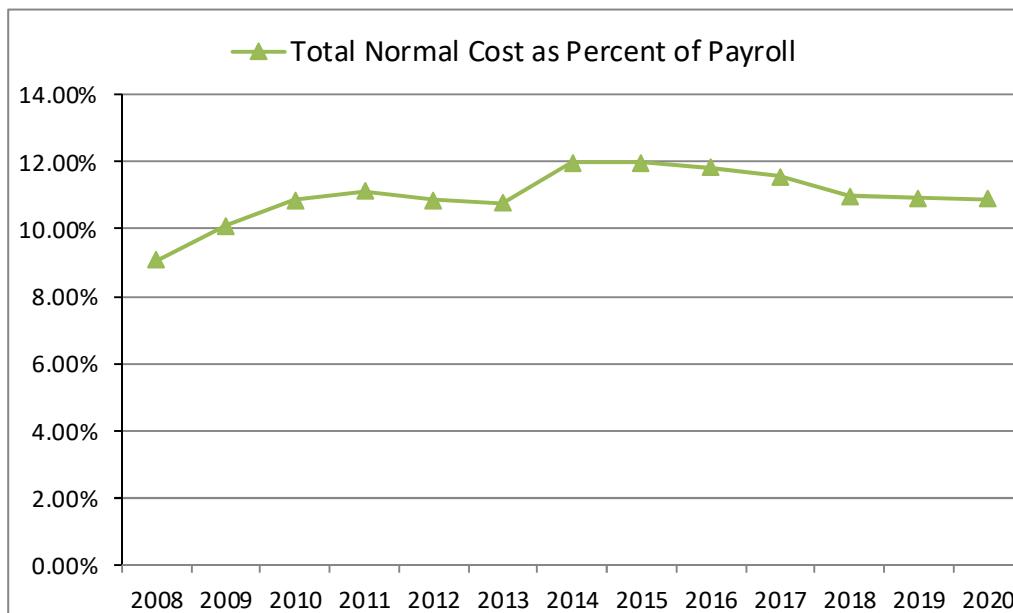
Item	Present Value of Future Normal Costs (1)	Actuarial Accrued Liabilities (2)	Total Present Value of Benefits (3) = (1) + (2)
Age and service allowances based on total service and disability benefits likely to be rendered by present active members	\$1,157,840,737	\$3,522,464,716	\$4,680,305,453
Death-in-service benefits likely to be paid on behalf of present active members (employer financed portion)	34,095,210	85,429,985	119,525,195
Separation benefits (refunds of contributions and deferred allowances) likely to be paid to present active members	353,489,531	(61,615,530)	291,874,001
Benefits likely to be paid to vested inactive members	0	410,863,933	410,863,933
Benefits to be paid to members due refunds	0	67,650,815	67,650,815
Benefits to be paid to current retirees, disabled members, beneficiaries, and future beneficiaries of current retirees	0	6,171,252,051	6,171,252,051
Total	\$1,545,425,478	\$10,196,045,970	\$11,741,471,448
Actuarial value of assets	0	7,459,695,656	7,459,695,656
Liabilities to be covered by future contributions	\$1,545,425,478	\$2,736,350,314	\$4,281,775,792

### Table 3

## History of Total Normal Cost

(Assumes No Future Cost-Of-Living Increases)

Fiscal Year Ending December 31	Total Normal Cost as Percent of Payroll
(1)	(2)
2008	9.08%
2009	10.10%
2010	10.86%
2011	11.11%
2012	10.86%
2013	10.77%
2014	11.96%
2015	11.96%
2016	11.83%
2017	11.55%
2018	10.96%
2019	10.91%
2020	10.87%



**Table 4**  
**Calculation of Total Actuarial Gain/(Loss)**  
**(Assumes No Future Cost-Of-Living Increases)**

Item	January 1, 2020
1. Derivation of Experience Gain/(Loss)	
a. Unfunded actuarial accrued liability (UAAL) - previous valuation	\$2,551,235,555
b. Normal cost (NC) for fiscal year ending December 31, 2019	194,455,298
c. Expected administrative expenses for fiscal year ending December 31, 2019	7,198,400
d. Actuarially determined contribution for fiscal year ending December 31, 2019	361,187,555
e. Interest accrual:	
(i) For whole year on (a)	178,586,489
(ii) For half year on (b) + (c) - (d)	(5,489,248)
(iii) Total interest: (e)(i) + (e)(ii)	173,097,241
f. Change in UAAL due to plan changes	0
g. Change in UAAL due to assumption changes	0
h. Expected UAAL current year: (a) + (b) + (c) - (d) + (e)(iii) + (f) + (g)	2,564,798,939
i. Actual UAAL current year	2,736,350,314
j. Experience gain/(loss): (h) - (i)	(171,551,375)
k. Experience gain/(loss) as a % of actuarial accrued liability	-1.68%
2. Approximate portion of gain/(loss) due to investments (at actuarial value)	(\$68,903,898)
3. Approximate portion of gain/(loss) due to contributions and administrative expenses higher or lower than expected*	(\$47,086,629)
4. Approximate amount of gain/(loss) due to liabilities: (1)(j) - (2) - (3)	(\$55,560,847)
a. Age & service retirements	(\$27,448,528)
b. Disability retirements	145,682
c. Death-in-service	39,728
d. Deferred members and withdrawal from employment	(21,276,354)
e. Rehires and new hires	(3,732,372)
f. Pay increases	7,534,464
g. Death after retirement	1,832,081
h. Service Purchases	(3,843,407)
i. Other	(8,812,142)
j. Other as a % of actuarial accrued liability	-0.09%

*\*Includes \$3.8 million in additional employee contributions for service purchases. These additional contributions offset the liability loss due to service purchases.*

**Table 5**  
**Change in Calculated Contribution Rate Since the Prior Valuation**  
**(Assumes No Future Cost-Of-Living Increases)**

Item	January 1, 2020
1. Calculated contribution rate as of January 1, 2019	11.64%
2. Change in contribution rate during year	
a. Change in employer normal cost	-0.04%
b. Change in employee contributions*	-0.25%
c. Actuarial (gain) loss from investments on actuarial value of assets	0.27%
d. Actuarial (gain) loss from liability sources & administrative expenses	0.22%
e. Difference between contributions made and required contribution	0.21%
f. Effect of payroll growing (faster)/slower than assumption	0.01%
g. Other changes	0.00%
h. Total change	0.42%
3. Calculated contribution rate as of January 1, 2020	12.06%

*\*Includes the impact of using the blended employee contribution rates for calendar years 2019 & 2020.*



**Table 6**  
**Statement of Plan Net Assets**

<b>Assets at Market Value</b>		
<b>Item</b>	<b>FYE 2019</b>	<b>FYE 2018</b>
1. Cash and Cash Equivalents (Operating Cash)	\$260,124,369	\$514,086,289
2. Receivables		
a. Insurance premium tax	\$0	\$0
b. Buy backs	0	0
c. Employer contributions	8,363,510	8,495,602
d. Employee contributions	8,243,908	8,372,198
e. Securities sold	28,339,394	50,124,358
f. Accrued interest and dividends	17,021,310	17,961,224
g. Currency contract receivable	176,103,231	1,497,075,482
h. Other	439,693	96,924
i. Rebate and fee income receivable	105,162	0
j. Total receivables	\$238,616,208	\$1,582,125,788
3. Investments, at Fair Value	\$7,882,964,892	\$6,795,047,684
4. Liabilities		
a. Benefits and refunds payable	(\$619,005)	(\$382,503)
b. Securities purchased	(37,925,431)	(107,338,085)
c. Administrative and consulting fees payable	(24,260,614)	(18,656,054)
d. Currency contract payable	(176,958,927)	(1,502,147,520)
e. Securities lending collateral	(351,382,650)	(431,367,002)
f. Total liabilities	(\$591,146,627)	(\$2,059,891,164)
5. Total Market Value of Assets Available for Benefits	\$7,790,558,842	\$6,831,368,597

**Table 7**  
**Reconciliation of Plan Net Assets**

Assets at Market Value		
Item	FYE 2019	FYE 2018
A. Market Value of Assets at Beginning of Year	\$6,831,368,597	\$7,358,526,012
B. Contribution Income:		
1. Contributions		
a. Employee	\$153,582,203	\$146,255,015
b. Employer	155,456,957	145,911,796
c. Other	5,956,723	6,596,214
d. Total	\$314,995,883	\$298,763,025
2. Investment Income		
a. Interest, dividends, and other income	\$121,126,636	\$125,205,471
b. Net appreciation	1,177,617,048	(327,282,467)
c. Investment expenses	(48,374,048)	(52,099,148)
d. Net investment income	\$1,250,369,636	\$(254,176,144)
3. Securities Lending		
a. Gross income	\$11,952,293	\$11,256,456
b. Deductions	(10,803,260)	(9,651,465)
c. Net investment income	\$1,149,033	\$1,604,991
4. Benefits and Refunds		
a. Refunds	\$(21,308,205)	\$(18,114,423)
b. Regular monthly benefits	(579,179,480)	(547,913,244)
c. Total	\$(600,487,685)	\$(566,027,667)
5. Administrative and Miscellaneous Expenses	\$(6,836,622)	\$(7,321,620)
C. Market Value of Assets at End of Year	\$7,790,558,842	\$6,831,368,597

**Table 8**  
**Progress of Fund Through December 31, 2019**

Plan Year Ending December 31	Employer Contributions*	Employee Contributions*	Administrative Expenses	Net Investment Income**	Benefit Payments	Transfers	Actuarial Value of Assets
Total	\$ 2,780,804,390	\$ 2,615,814,608	\$ (90,849,721)	\$ 9,326,938,322	\$(7,823,495,404)	\$ (115,633,895)	
1986	\$ 41,364,465	\$ 36,365,804	\$ (782,000)	\$ 98,998,090	\$ (42,082,765)	\$ -	\$ 900,097,591
1987	39,901,834	36,039,418	(808,023)	91,374,783	(50,604,364)	-	1,016,001,239
1988	38,414,939	33,222,264	(444,343)	103,025,282	(48,627,479)	-	1,141,591,902
1989	36,139,394	36,231,108	(424,136)	128,370,680	(55,459,353)	-	1,286,449,595
1990	38,668,634	38,960,372	(850,148)	114,218,588	(61,154,261)	-	1,416,292,780
1991	38,903,350	39,288,267	(863,301)	148,164,188	(69,348,501)	-	1,572,336,783
1992	42,354,843	42,883,874	(909,653)	175,246,400	(75,211,430)	-	1,756,700,817
1993	41,596,571	42,266,219	(801,026)	189,281,426	(82,480,713)	-	1,946,563,294
1994	42,791,243	43,415,880	(888,518)	136,210,578	(89,707,717)	-	2,078,384,760
1995	43,714,263	44,435,762	(937,480)	230,731,781	(99,689,985)	-	2,296,639,101
1996	43,495,146	44,761,611	(1,028,163)	233,212,720	(108,536,621)	-	2,508,543,794
1997	44,958,544	46,152,691	(1,147,818)	314,340,179	(117,126,096)	-	2,795,721,294
1998	46,183,091	47,366,181	(1,074,562)	436,098,461	(123,858,991)	-	3,200,435,474
1999	48,681,209	50,106,535	(1,182,899)	475,758,627	(132,428,572)	-	3,641,370,374
2000	50,539,675	51,868,059	(1,096,747)	592,379,739	(144,620,949)	-	4,190,440,151
2001	56,517,377	53,792,429	(1,387,930)	439,286,379	(156,189,100)	-	4,582,462,306
2002	57,377,428	58,234,324	(1,281,554)	(66,209,697)	(171,160,286)	(106,978,719)	4,352,423,802
2003	55,363,788	60,848,296	(1,435,922)	376,524,142	(185,826,481)	-	4,657,897,625
2004	60,573,670	61,412,824	(1,644,382)	127,831,761	(201,772,174)	-	4,704,299,324
2005	65,191,670	63,381,309	(1,930,627)	238,882,774	(217,308,520)	(8,655,176)	4,843,861,114
2006	72,664,403	69,020,297	(1,949,051)	409,948,934	(232,944,164)	-	5,160,601,533
2007	83,149,236	78,495,298	(2,005,783)	583,547,681	(249,765,088)	-	5,654,022,877
2008	88,451,655	84,814,014	(2,778,990)	(720,402,274)	(268,232,301)	-	4,835,874,981
2009***	244,063,923	89,298,711	(3,081,105)	868,641,735	(292,256,569)	-	5,742,541,676
2010	104,757,666	99,291,423	(3,600,747)	170,797,772	(314,256,856)	-	5,799,530,934
2011	122,557,906	116,691,540	(5,541,488)	71,962,242	(343,979,208)	-	5,761,221,926
2012	124,648,088	119,052,404	(6,463,506)	126,138,774	(374,629,714)	-	5,749,967,972
2013	128,277,269	122,611,180	(6,513,680)	654,726,838	(404,568,029)	-	6,244,501,550
2014	129,627,747	141,061,289	(5,258,065)	535,776,435	(436,096,614)	-	6,609,612,342
2015	144,622,373	153,529,134	(5,410,522)	382,521,078	(469,954,814)	-	6,814,919,591
2016	151,488,715	152,422,538	(6,305,865)	452,136,957	(501,610,080)	-	7,063,051,856
2017	148,746,669	149,752,251	(6,863,445)	495,488,269	(535,492,257)	-	7,314,683,343
2018	147,632,510	151,130,515	(7,321,620)	278,282,588	(566,027,667)	-	7,318,379,669
2019	157,385,096	157,610,787	(6,836,622)	433,644,411	(600,487,685)	-	7,459,695,656

\* Employer contributions include other funding sources and employee contributions may include member redeposits and member service purchase contributions

\*\* Net of investment expenses

\*\*\* December 31, 2009 market values exclude Air Guard Firefighters



**Table 9**  
**Development of Actuarial Value of Assets**

Item	FYE 2019	FYE 2018
1. Actuarial value of assets, beginning of year (without corridor)	\$7,318,379,669	\$7,314,683,343
2. Market value, end of year	\$7,790,558,842	\$6,831,368,597
3. Market value, beginning of year	\$6,831,368,597	\$7,358,526,012
4. Non-investment/administrative net cash flow:		
a. Employee contributions	\$153,582,203	\$146,255,015
b. Employer contributions	155,456,957	145,911,796
c. Other contributions	5,956,723	6,596,214
d. Refund of employee accounts	(21,308,205)	(18,114,423)
e. Retirement benefits	(579,179,480)	(547,913,244)
f. Administrative expenses	(6,836,622)	(7,321,620)
g. Total net cash flow: [sum of (4a) through (4f)]	(\$292,328,424)	(\$274,586,262)
5. Investments and securities lending:		
a. Interest and dividends on investments	\$121,126,636	\$125,205,471
b. Gross income from securities lending	11,952,293	11,256,456
c. Fees and expenses	(59,177,308)	(61,750,613)
d. Total net income: [sum of (5a) through (5c)]	\$73,901,621	\$74,711,314
6. Investment income:		
a. Actual market return: (2) - (3) - (4g) - (5d)	\$1,177,617,048	(\$327,282,467)
b. Assumed rate of return	7.00%	7.00%
c. Assumed amount of return	394,235,732	430,937,531
d. Amount subject to phase-in: (6a) - (6c)	\$783,381,316	(\$758,219,998)
7. Phase-in recognition of investment income:		
a. Current year: 0.20 * (6d)	\$156,676,263	(\$151,644,000)
b. First prior year	(151,644,000)	83,113,422
c. Second prior year	83,113,422	(7,136,709)
d. Third prior year	(7,136,709)	(115,501,918)
e. Fourth prior year	(115,501,918)	(36,197,052)
f. Total recognition	(\$34,492,942)	(\$227,366,257)
<b>8. Actuarial value of assets, end of year</b>		
a. Preliminary actuarial value of assets, end of year: (1) + (4g) + (5d) + (6c) + (7f)	\$7,459,695,656	\$7,318,379,669
b. Upper corridor limit: 120% * (2)	9,348,670,610	8,197,642,316
c. Lower corridor limit: 80% * (2)	6,232,447,074	5,465,094,878
d. Actuarial value of assets, end of year	\$7,459,695,656	\$7,318,379,669
9. Difference between market and actuarial value of assets	\$330,863,186	(\$487,011,072)
<b>10. Actuarial rate of return</b>	6.05%	3.88%
<b>11. Market rate of return*</b>	18.72%	-3.52%
<b>12. Ratio of actuarial value to market value of assets</b>	95.75%	107.13%

\* Current year market rate of return is based on unaudited data and is supplied by the plan's investment consultant.

## Table 10

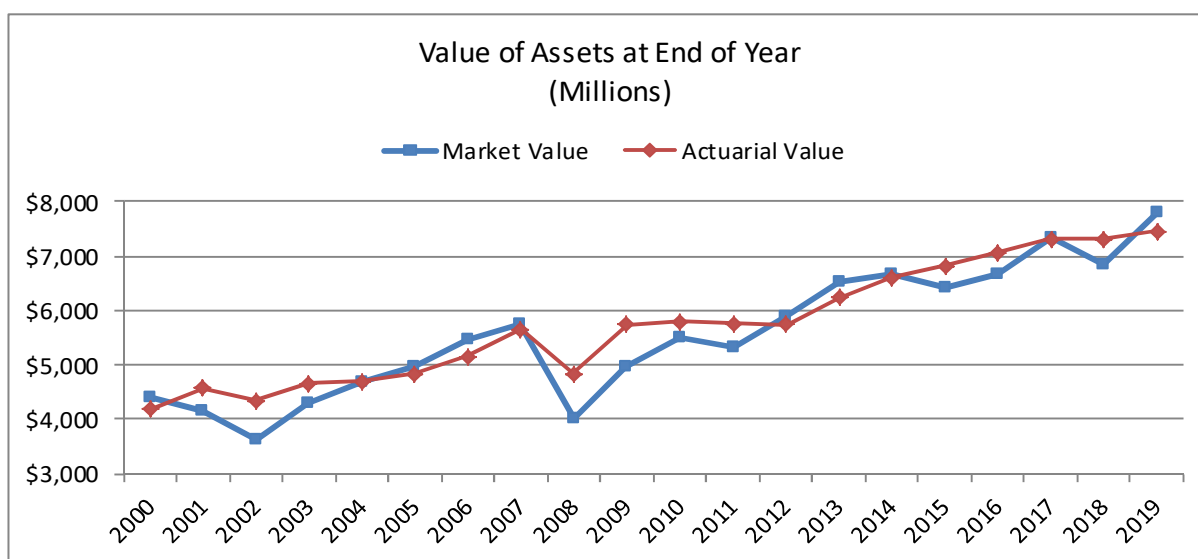
### History of Investment Returns

Plan Year (1)	Market Value (2)	Actuarial Value (3)
2000	-0.99%	16.37%
2001	-4.47%	10.54%
2002	-9.29%	-1.47%
2003	21.00%	8.72%
2004	11.54%	2.77%
2005	8.22%	5.13%
2006	12.63%	8.55%
2007	7.44%	11.41%
2008	-29.63%	-12.85%
2009	23.72%	17.89%
2010	13.80%	3.00%
2011	-0.90%	1.25%
2012	14.05%	2.22%
2013	13.53%	11.55%
2014	4.70%	8.70%
2015	-0.26%	5.87%
2016	7.60%	6.74%
2017	14.20%	7.14%
2018	-3.52%	3.88%
2019	18.72%	6.05%

**Average returns:**

Last five years:	7.02%	5.93%
Last ten years:	7.94%	5.60%

The market returns above are gross of investment expenses and were provided by the plan's investment consultant. The actuarial returns above are based on the financial information provided by the plan's auditors.



**Table 11**  
**Solvency Test**

Valuation Date January 1	Total Active Member Contributions (1)	Inactive and Pensioner Liability (2)	Employer Financed Active Accrued Liability (3)	Actuarial Value of Assets	Percentage of Liabilities Covered by Assets		
					(1)	(2)	(3)
2005	\$840,104,000	\$2,592,159,000	\$2,103,929,000	\$4,704,299,324	100%	100%	60.5%
2006	888,544,000	2,354,500,000	1,848,710,000	4,843,861,114	100%	100%	86.6%
2007	941,572,000	2,488,504,000	2,038,153,000	5,160,601,533	100%	100%	84.9%
2008	991,444,000	2,699,505,000	2,325,036,000	5,654,022,877	100%	100%	84.4%
2009	1,036,443,231	2,796,308,000	2,319,370,769	4,835,874,981	100%	100%	43.2%
2010	1,109,001,753	2,933,630,669	2,519,698,185	5,742,541,676	100%	100%	67.3%
2011	1,161,508,226	3,178,244,317	2,515,890,340	5,799,530,934	100%	100%	58.0%
2012	1,226,273,201	3,455,740,883	2,355,172,581	5,761,221,926	100%	100%	45.8%
2013	1,286,009,555	3,724,948,051	2,308,247,120	5,749,967,972	100%	100%	32.0%
2014	1,333,532,543	4,251,120,151	2,460,394,278	6,244,501,550	100%	100%	26.8%
2015	1,394,083,171	4,600,839,298	2,375,744,013	6,609,612,342	100%	100%	25.9%
2016	1,472,111,790	4,897,375,395	2,343,866,339	6,814,919,591	100%	100%	19.0%
2017	1,491,204,773	5,255,363,783	2,292,735,275	7,063,051,856	100%	100%	13.8%
2018	1,504,862,214	5,994,581,648	2,089,209,114	7,314,683,343	100%	97%	0.0%
2019	1,527,496,996	6,322,068,735	2,020,049,493	7,318,379,669	100%	92%	0.0%
2020	1,549,303,903	6,649,766,799	1,996,975,268	7,459,695,656	100%	89%	0.0%

*Excludes Air Guard beginning in 2010*

*Effective January 1, 2010, liabilities are calculated assuming no future cost-of-living increases.*

**Table 12**  
**Schedule of Funding Progress**

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Valuation Date January 1	Actuarial Value of Assets	Actuarial Accrued Liability (AAL)	Unfunded AAL (UAAL) [(3) - (2)]	Funded Ratio [(2)/(3)]	Covered Payroll	UAAL as a Percentage of Covered Payroll [(4)/(6)]
2001	\$4,190,440,151	\$3,683,174,000	(\$507,266,151)	113.77%	\$897,641,000	(56.51%)
2002	4,582,462,306	4,442,033,000	(140,429,306)	103.16%	964,121,000	(14.57%)
2003	4,352,423,802	4,718,618,000	366,194,198	92.24%	988,135,000	37.06%
2004	4,657,897,625	5,077,443,000	419,545,375	91.74%	1,032,259,000	40.64%
2005	4,704,299,324	4,902,322,000	198,022,676	95.96%	1,086,736,000	18.22%
2006	4,843,861,114	5,091,763,000	247,901,886	95.13%	1,156,400,000	21.44%
2007	5,160,601,533	5,468,229,000	307,627,467	94.37%	1,285,096,000	23.94%
2008	5,654,022,877	6,015,985,000	361,962,123	93.98%	1,462,474,000	24.75%
2009	4,835,874,981	6,152,122,000	1,316,247,019	78.60%	1,585,728,000	83.01%
2010	5,742,541,676	6,562,330,607	819,788,931	87.51%	1,697,341,384	48.30%
2011	5,799,530,934	6,855,642,883	1,056,111,949	84.59%	1,728,433,786	61.10%
2012	5,761,221,926	7,037,186,665	1,275,964,739	81.87%	1,756,856,648	72.63%
2013	5,749,967,972	7,319,204,726	1,569,236,754	78.56%	1,782,069,208	88.06%
2014	6,244,501,550	8,045,046,972	1,800,545,422	77.62%	1,782,062,471	101.04%
2015	6,609,612,342	8,370,666,482	1,761,054,140	78.96%	1,818,197,022	96.86%
2016	6,814,919,591	8,713,353,524	1,898,433,933	78.21%	1,858,678,687	102.14%
2017	7,063,051,856	9,039,303,831	1,976,251,975	78.14%	1,851,873,634	106.72%
2018	7,314,683,343	9,588,652,976	2,273,969,633	76.28%	1,784,888,475	127.40%
2019	7,318,379,669	9,869,615,224	2,551,235,555	74.15%	1,781,668,069	143.19%
2020	7,459,695,656	10,196,045,970	2,736,350,314	73.16%	1,824,979,015	149.94%

*Excludes Air Guard beginning in 2010*

*Effective January 1, 2010, liabilities are calculated assuming no future cost-of-living increases.*

**Table 13**

**Schedule of Contributions from the Employer(s) and Other Contributing Entities**

(1)	(2)	(3)	(4)	(5)	(6)
Fiscal Year Ending December 31	Actuarially Determined Contribution		Employer Contributions*		Percentage of Actuarially Determined Contribution Contributed [(5)/(3)]
	% of Payroll	Amount	% of Payroll	Amount	
2004	8.76%	\$90,477,000	5.87%	\$60,573,670	66.95%
2005	10.00%	108,707,000	6.00%	65,191,670	59.97%
2006	5.68%	65,714,000	6.28%	72,664,403	110.58%
2007	5.68%	73,035,000	6.47%	83,149,236	113.85%
2008	5.68%	83,036,000	6.05%	88,451,655	106.52%
2009	9.15%	145,015,000	15.39%	244,063,923**	168.32%
2010	8.06%	136,689,664	6.17%	104,757,666	76.64%
2011	7.60%	131,260,466	7.09%	122,557,906	93.37%
2012	8.04%	141,299,725	7.09%	124,648,088	88.22%
2013	8.86%	158,013,754	7.20%	128,277,269	81.18%
2014	10.28%	183,086,430	7.27%	129,627,747	70.80%
2015	9.26%	168,411,742	8.12%	144,622,373	85.87%
2016	9.38%	174,211,753	8.15%	151,488,715	86.96%
2017	9.37%	173,551,431	8.03%	148,746,669	85.71%
2018	10.74%	191,677,662	8.27%	147,632,510	77.02%
2019	11.64%	207,518,684	8.82%	157,385,096	75.84%
2020	12.06%	219,815,919	-	-	-

*Excludes Air Guard beginning December 31, 2009, including Employer Contributions of \$149,244 as of December 31, 2009.*

*Effective January 1, 2010, liabilities are calculated assuming no future cost-of-living increases.*

\* Includes other funding sources but excludes member redeposits and member service purchase contributions.

\*\* There was a \$150.6 million legislative appropriation to address the increase in school district employee pay.



**Table 14**  
**Reconciliation of Participant Data**

	<b>Active Participants</b>		<b>Vested Former</b>	<b>Retired</b>			<b>Participants</b>	
	<b>Tier 1</b>	<b>Tier 2</b>	<b>Participants</b>	<b>Participants</b>	<b>Disabled</b>	<b>Beneficiaries</b>	<b>Due Refunds</b>	<b>Total</b>
<b>Number as of January 1, 2019</b>	<b>19,518</b>	<b>15,355</b>	<b>6,826</b>	<b>25,011</b>	<b>232</b>	<b>2,539</b>	<b>24,198</b>	<b>93,679</b>
New participants	-	3,873	-	-	-	15	538	4,426
Vested terminations	(640)	(445)	1,091	-	-	-	(6)	-
Retirements	(1,070)	(54)	(389)	1,513	-	-	-	-
Disability	(3)	-	(1)	(1)	5	-	-	-
Deceased with beneficiary	(18)	(2)	(19)	(196)	(3)	240	(2)	-
Deceased without beneficiary	(12)	(8)	(13)	(462)	(3)	(122)	(18)	(638)
Due refunds	(5)	(1,504)	(9)	-	-	-	1,518	-
Lump sum payoffs	(111)	(456)	(169)	-	-	-	(803)	(1,539)
Rehires/return to active	187	601	(214)	(7)	-	-	(417)	150
Certain period expired	-	-	-	-	-	(12)	-	(12)
Reclassifications	(1)	1	-	-	-	-	-	-
Data corrections	-	-	-	1	-	-	-	1
<b>Number as of January 1, 2020</b>	<b>17,845</b>	<b>17,361</b>	<b>7,103</b>	<b>25,859</b>	<b>231</b>	<b>2,660</b>	<b>25,008</b>	<b>96,067</b>

**Table 15**  
**Demographic Statistics**

	January 1		
	2020	2019	Change
<u>Active Participants</u>			
Number	35,206	34,873	1.0%
<i>Vested</i>	23,762	23,886	
<i>Not vested</i>	11,444	10,987	
Average age (years)	46.07	46.24	-0.4%
Average service (years)	9.74	9.97	-2.3%
Average entry age (years)	36.33	36.27	0.2%
Total payroll*	\$1,824,979,015	\$1,781,668,069	2.4%
Average payroll*	\$51,837	\$51,090	1.5%
Total employee contributions with interest	\$1,549,303,903	\$1,527,496,996	1.4%
Average employee contributions with interest	\$44,007	\$43,802	0.5%
<u>Vested Former Participants</u>			
Number	7,103	6,826	4.1%
Average age (years)	50.65	50.99	-0.7%
Total employee contributions with interest	\$246,472,591	\$234,092,797	5.3%
Average employee contributions with interest	\$34,700	\$34,294	1.2%
<u>Service Retirees</u>			
Number	25,859	25,011	3.4%
Average age (years)	72.25	72.04	0.3%
Total annual benefits	\$545,473,041	\$517,594,458	5.4%
Average annual benefit	\$21,094	\$20,695	1.9%
<u>Disability Retirees</u>			
Number	231	232	-0.4%
Average age (years)	65.79	65.03	1.2%
Total annual benefits	\$3,794,983	\$3,743,642	1.4%
Average annual benefit	\$16,428	\$16,136	1.8%
<u>Beneficiaries</u>			
Number	2,660	2,539	4.8%
Average age (years)	76.14	76.02	0.2%
Total annual benefits	\$39,765,283	\$37,193,925	6.9%
Average annual benefit	\$14,949	\$14,649	2.1%
<u>Participants Due Refunds</u>			
Number	25,008	24,198	3.3%
Total Refunds Due	\$67,650,815	\$64,860,928	4.3%

\* Projected payroll for the upcoming valuation year

# Table 16

## Distribution of Male Active Members by Age and by Years of Service

Average Age = 46.8      Average Service = 10.1

Age Last Birthday		Whole Years of Service at Valuation Date							Totals
		0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	
Less than 20	Count	26	-	-	-	-	-	-	26
	Avg. Salary	\$25,907	-	-	-	-	-	-	\$25,907
20-24	Count	369	-	-	-	-	-	-	369
	Avg. Salary	35,275	-	-	-	-	-	-	35,275
25-29	Count	730	149	3	-	-	-	-	882
	Avg. Salary	43,181	48,420	*	-	-	-	-	44,119
30-34	Count	708	460	96	1	-	-	-	1,265
	Avg. Salary	47,225	58,509	57,227	*	-	-	-	52,090
35-39	Count	612	456	379	71	1	-	-	1,519
	Avg. Salary	49,207	61,716	66,466	67,827	*	-	-	58,145
40-44	Count	423	391	375	253	47	-	-	1,489
	Avg. Salary	49,946	63,252	70,896	72,941	\$73,288	-	-	63,360
45-49	Count	448	312	299	221	239	45	-	1,564
	Avg. Salary	49,079	60,106	65,926	72,977	77,081	\$79,690	-	63,036
50-54	Count	391	321	272	213	225	232	65	1,719
	Avg. Salary	47,774	60,360	64,953	67,299	77,906	81,493	\$74,155	64,754
55-59	Count	383	271	278	236	191	153	201	1,713
	Avg. Salary	45,994	53,137	63,221	63,733	70,891	76,438	76,132	61,395
60-64	Count	293	269	201	183	124	84	177	1,331
	Avg. Salary	44,865	54,148	59,464	60,077	70,612	69,901	77,704	59,383
65-69	Count	148	105	66	59	34	25	44	481
	Avg. Salary	35,802	49,770	60,579	60,705	62,456	73,274	77,029	52,909
70 & Over	Count	65	45	16	27	7	6	18	184
	Avg. Salary	23,791	35,202	50,415	53,795	43,064	74,375	78,823	41,066
Totals	Count	4,596	2,779	1,985	1,264	868	545	505	12,542
	Avg. Salary	\$45,292	\$57,901	\$65,067	\$67,130	\$73,935	\$77,683	\$76,603	\$58,067

Average salary represents annualized salary earned in 2019 and is not shown for cells with counts less than or equal to three participants

# Table 17

## Distribution of Female Active Members by Age and by Years of Service

Average Age = 45.7      Average Service = 9.5

Age Last Birthday		Whole Years of Service at Valuation Date							Totals
		0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	
Less than 20	Count	40	-	-	-	-	-	-	40
	Avg. Salary	\$22,038	-	-	-	-	-	-	\$22,038
20-24	Count	732	3	-	-	-	-	-	735
	Avg. Salary	30,473	*	-	-	-	-	-	30,499
25-29	Count	1,483	259	-	-	-	-	-	1,742
	Avg. Salary	38,860	\$48,122	-	-	-	-	-	40,237
30-34	Count	1,288	884	192	-	-	-	-	2,364
	Avg. Salary	36,797	52,502	\$56,440	-	-	-	-	44,265
35-39	Count	1,387	858	654	127	1	-	-	3,027
	Avg. Salary	36,029	50,646	58,977	\$62,264	*	-	-	46,236
40-44	Count	1,171	759	566	455	75	1	-	3,027
	Avg. Salary	35,828	48,880	56,958	65,367	\$65,905	*	-	48,237
45-49	Count	923	706	544	416	319	72	-	2,980
	Avg. Salary	36,307	45,771	53,901	61,895	69,094	\$69,396	-	49,642
50-54	Count	664	531	495	418	283	258	66	2,715
	Avg. Salary	37,143	43,402	49,824	55,907	63,878	73,909	\$69,879	50,645
55-59	Count	640	487	504	527	399	271	231	3,059
	Avg. Salary	35,461	41,727	47,514	49,579	55,456	64,348	68,021	48,503
60-64	Count	381	328	365	330	285	217	276	2,182
	Avg. Salary	33,153	42,162	42,355	47,711	49,924	55,294	65,618	46,747
65-69	Count	124	79	122	88	77	45	73	608
	Avg. Salary	24,364	37,418	45,247	51,040	46,308	52,984	59,212	43,193
70 & Over	Count	49	29	24	32	12	20	19	185
	Avg. Salary	20,441	23,419	39,280	37,605	38,538	46,121	47,681	33,068
Totals	Count	8,882	4,923	3,466	2,393	1,451	884	665	22,664
	Avg. Salary	\$35,765	\$47,265	\$52,366	\$56,137	\$58,922	\$64,305	\$65,660	\$46,426

Average salary represents annualized salary earned in 2019 and is not shown for cells with counts less than or equal to three participants

## Table 18

### Distribution of Total Active Members by Age and by Years of Service

Average Age = 46.1      Average Service = 9.7

Age Last Birthday		Whole Years of Service at Valuation Date							Totals
		0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	
<b>Less than 20</b>	Count	66	-	-	-	-	-	-	66
	Avg. Salary	\$23,562	-	-	-	-	-	-	\$23,562
<b>20-24</b>	Count	1,101	3	-	-	-	-	-	1,104
	Avg. Salary	32,082	*	-	-	-	-	-	32,095
<b>25-29</b>	Count	2,213	408	3	-	-	-	-	2,624
	Avg. Salary	40,285	48,231	*	-	-	-	-	41,542
<b>30-34</b>	Count	1,996	1,344	288	1	-	-	-	3,629
	Avg. Salary	40,496	54,558	56,702	*	-	-	-	46,993
<b>35-39</b>	Count	1,999	1,314	1,033	198	2	-	-	4,546
	Avg. Salary	40,064	54,488	61,725	64,259	*	-	-	50,215
<b>40-44</b>	Count	1,594	1,150	941	708	122	1	-	4,516
	Avg. Salary	39,574	53,767	62,512	68,073	\$68,749	*	-	53,223
<b>45-49</b>	Count	1,371	1,018	843	637	558	117	-	4,544
	Avg. Salary	40,481	50,165	58,166	65,740	72,515	\$73,355	-	54,252
<b>50-54</b>	Count	1,055	852	767	631	508	490	131	4,434
	Avg. Salary	41,083	49,791	55,189	59,753	70,091	77,500	\$72,001	56,115
<b>55-59</b>	Count	1,023	758	782	763	590	424	432	4,772
	Avg. Salary	39,404	45,806	53,098	53,957	60,453	68,711	71,795	53,131
<b>60-64</b>	Count	674	597	566	513	409	301	453	3,513
	Avg. Salary	38,244	47,563	48,431	52,123	56,196	59,370	70,340	51,535
<b>65-69</b>	Count	272	184	188	147	111	70	117	1,089
	Avg. Salary	30,588	44,467	50,629	54,919	51,254	60,231	65,913	47,484
<b>70 &amp; Over</b>	Count	114	74	40	59	19	26	37	369
	Avg. Salary	22,351	30,585	43,734	45,014	40,206	52,641	62,831	37,056
<b>Totals</b>	Count	<b>13,478</b>	<b>7,702</b>	<b>5,451</b>	<b>3,657</b>	<b>2,319</b>	<b>1,429</b>	<b>1,170</b>	<b>35,206</b>
	Avg. Salary	<b>\$39,014</b>	<b>\$51,103</b>	<b>\$56,991</b>	<b>\$59,936</b>	<b>\$64,541</b>	<b>\$69,407</b>	<b>\$70,383</b>	<b>\$50,573</b>

*Average salary represents annualized salary earned in 2019 and is not shown for cells with counts less than or equal to three participants*

**Table 19****Distribution of Male Deferred Members by Age and by Years of Service**

Average Age = 50.1      Average Service = 8.5

Age Last Birthday	Whole Years of Service at Valuation Date							Totals
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	
Less than 20	-	-	-	-	-	-	-	-
20-24	2	-	-	-	-	-	-	2
25-29	18	13	-	-	-	-	-	31
30-34	66	104	6	-	-	-	-	176
35-39	71	161	37	1	-	-	-	270
40-44	59	160	61	12	1	-	-	293
45-49	68	161	49	31	6	-	-	315
50-54	47	175	84	26	12	5	-	349
55-59	65	188	103	49	27	6	1	439
60-64	50	100	48	11	8	-	-	217
65-69	29	55	15	3	2	-	1	105
70 & Over	17	30	5	6	-	1	1	60
<b>Totals</b>	<b>492</b>	<b>1,147</b>	<b>408</b>	<b>139</b>	<b>56</b>	<b>12</b>	<b>3</b>	<b>2,257</b>

**Table 20****Distribution of Female Deferred Members by Age and by Years of Service**

Average Age = 50.9      Average Service = 8.6

Age Last Birthday	Whole Years of Service at Valuation Date							Totals
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	
Less than 20	-	-	-	-	-	-	-	-
20-24	4	-	-	-	-	-	-	4
25-29	50	32	1	-	-	-	-	83
30-34	137	215	7	-	-	-	-	359
35-39	138	305	60	-	-	-	-	503
40-44	137	313	93	26	-	-	-	569
45-49	100	321	136	54	16	-	-	627
50-54	100	377	174	72	23	10	1	757
55-59	151	421	224	129	47	10	1	983
60-64	108	260	117	47	16	4	3	555
65-69	49	129	39	15	10	1	4	247
70 & Over	49	81	20	5	2	-	2	159
<b>Totals</b>	<b>1,023</b>	<b>2,454</b>	<b>871</b>	<b>348</b>	<b>114</b>	<b>25</b>	<b>11</b>	<b>4,846</b>

**Table 21****Distribution of Total Deferred Members by Age and by Years of Service**

Average Age = 50.7      Average Service = 8.5

Age Last Birthday	Whole Years of Service at Valuation Date							Totals
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	
Less than 20	-	-	-	-	-	-	-	-
20-24	6	-	-	-	-	-	-	6
25-29	68	45	1	-	-	-	-	114
30-34	203	319	13	-	-	-	-	535
35-39	209	466	97	1	-	-	-	773
40-44	196	473	154	38	1	-	-	862
45-49	168	482	185	85	22	-	-	942
50-54	147	552	258	98	35	15	1	1,106
55-59	216	609	327	178	74	16	2	1,422
60-64	158	360	165	58	24	4	3	772
65-69	78	184	54	18	12	1	5	352
70 & Over	66	111	25	11	2	1	3	219
<b>Totals</b>	<b>1,515</b>	<b>3,601</b>	<b>1,279</b>	<b>487</b>	<b>170</b>	<b>37</b>	<b>14</b>	<b>7,103</b>



**Table 22**

**Schedule of Pension Recipients Added to and Removed from Rolls**

Fiscal Year Ending December 31	Added to Rolls*		Removed from Rolls		Total		Percent Increase in Annual Pension Benefits	Average Annual Pension Benefit
	Count	Annual Pension Benefits	Count	Annual Pension Benefits	Count	Annual Pension Benefits		
2008	1,290	\$26,985,322	552	\$3,650,746	18,333	\$268,901,376	9.50%	\$14,668
2009	1,160	24,062,484	577	6,292,131	18,916	286,671,729	6.61%	15,155
2010	1,388	31,055,004	562	6,314,155	19,742	311,412,579	8.63%	15,774
2011	1,538	34,517,321	592	7,019,999	20,688	338,909,901	8.83%	16,382
2012	1,497	35,646,627	585	6,920,227	21,600	367,636,301	8.48%	17,020
2013	1,745	39,633,549	614	8,227,809	22,731	399,042,042	8.54%	17,555
2014	1,755	42,076,101	726	9,207,206	23,760	431,910,937	8.24%	18,178
2015	1,657	38,445,600	689	9,453,053	24,728	460,903,484	6.71%	18,639
2016	1,768	43,327,957	728	9,191,130	25,768	495,040,311	7.41%	19,211
2017	1,806	43,470,131	766	10,395,795	26,808	528,114,647	6.68%	19,700
2018	1,786	41,353,498	812	10,936,120	27,782	558,532,025	5.76%	20,104
2019	1,773	42,280,614	805	11,779,332	28,750	589,033,307	5.46%	20,488

\* Includes cost-of-living increases

**Table 23**  
**Retired and Disabled Members by Option Code**

Option Code*	Count			Monthly Benefit			Count elected self-funded COLA**		
	Male	Female	Total	Male	Female	Total	1%	2%	3%
<b>1</b>	2,170	6,796	8,966	\$3,886,633	\$10,006,719	\$13,893,352	35	24	40
<b>2</b>	4,726	3,670	8,396	10,345,240	6,144,606	16,489,846	22	34	41
<b>2P</b>	1,499	2,078	3,577	2,864,514	3,771,988	6,636,502	12	18	20
<b>3</b>	484	595	1,079	1,164,568	1,035,632	2,200,200	4	3	3
<b>3P</b>	305	608	913	737,038	1,319,197	2,056,236	5	6	7
<b>4a</b>	319	585	904	505,720	808,838	1,314,558	6	2	6
<b>4b</b>	67	105	172	105,396	153,102	258,499	6	5	3
<b>5</b>	530	1,553	2,083	848,269	2,074,874	2,923,143	14	9	15
<b>Total</b>	<b>10,100</b>	<b>15,990</b>	<b>26,090</b>	<b>\$20,457,378</b>	<b>\$25,314,958</b>	<b>\$45,772,335</b>	<b>104</b>	<b>101</b>	<b>135</b>
<b>Beneficiaries</b>	<b>622</b>	<b>2,038</b>	<b>2,660</b>	<b>\$694,056</b>	<b>\$2,619,717</b>	<b>\$3,313,773</b>	-	-	-
<b>Grand Total</b>	<b>10,722</b>	<b>18,028</b>	<b>28,750</b>	<b>\$21,151,434</b>	<b>\$27,934,675</b>	<b>\$49,086,108</b>	<b>104</b>	<b>101</b>	<b>135</b>

\*See optional forms of payment in Appendix B

\*\*Option totals in left portion of the table include these counts of members who elected a self-funded COLA option.

**Table 24**  
**Pensioners by Monthly Benefit and Option Code**

<b>Males</b>	<b>Option Code*</b>								
<b>Benefit Amount</b>	<b>1</b>	<b>2</b>	<b>2P</b>	<b>3</b>	<b>3P</b>	<b>4a**</b>	<b>4b</b>	<b>5</b>	<b>Total</b>
<b>Under \$200</b>	98	136	64	5	5	28	2	111	449
<b>\$200-\$399</b>	212	329	149	17	18	33	11	157	926
<b>\$400-\$599</b>	236	338	140	22	14	47	9	151	957
<b>\$600-\$799</b>	190	300	113	25	13	32	7	103	783
<b>\$800-\$999</b>	161	282	98	21	13	20	6	89	690
<b>\$1,000-\$1,499</b>	270	574	183	73	39	56	9	159	1,363
<b>\$1,500-\$1,999</b>	222	530	134	52	31	31	4	84	1,088
<b>\$2,000-\$2,499</b>	178	497	153	67	40	20	6	77	1,038
<b>\$2,500 &amp; over</b>	603	1,740	465	202	132	70	13	203	3,428
<b>Total</b>	<b>2,170</b>	<b>4,726</b>	<b>1,499</b>	<b>484</b>	<b>305</b>	<b>337</b>	<b>67</b>	<b>1,134</b>	<b>10,722</b>
<b>Females</b>									
<b>Benefit Amount</b>	<b>1</b>	<b>2</b>	<b>2P</b>	<b>3</b>	<b>3P</b>	<b>4a**</b>	<b>4b</b>	<b>5</b>	<b>Total</b>
<b>Under \$200</b>	481	233	86	17	15	55	5	306	1,198
<b>\$200-\$399</b>	871	416	206	52	28	101	17	469	2,160
<b>\$400-\$599</b>	768	338	178	49	40	77	11	441	1,902
<b>\$600-\$799</b>	639	263	138	57	36	63	12	346	1,554
<b>\$800-\$999</b>	517	276	154	39	38	42	10	282	1,358
<b>\$1,000-\$1,499</b>	1,001	541	294	95	85	81	16	552	2,665
<b>\$1,500-\$1,999</b>	681	362	220	82	68	41	12	379	1,845
<b>\$2,000-\$2,499</b>	519	308	212	62	63	36	1	271	1,472
<b>\$2,500 &amp; over</b>	1,319	933	590	142	235	113	21	521	3,874
<b>Total</b>	<b>6,796</b>	<b>3,670</b>	<b>2,078</b>	<b>595</b>	<b>608</b>	<b>609</b>	<b>105</b>	<b>3,567</b>	<b>18,028</b>
<b>Males &amp; Females</b>									
<b>Benefit Amount</b>	<b>1</b>	<b>2</b>	<b>2P</b>	<b>3</b>	<b>3P</b>	<b>4a**</b>	<b>4b</b>	<b>5</b>	<b>Total</b>
<b>Under \$200</b>	579	369	150	22	20	83	7	417	1,647
<b>\$200-\$399</b>	1,083	745	355	69	46	134	28	626	3,086
<b>\$400-\$599</b>	1,004	676	318	71	54	124	20	592	2,859
<b>\$600-\$799</b>	829	563	251	82	49	95	19	449	2,337
<b>\$800-\$999</b>	678	558	252	60	51	62	16	371	2,048
<b>\$1,000-\$1,499</b>	1,271	1,115	477	168	124	137	25	711	4,028
<b>\$1,500-\$1,999</b>	903	892	354	134	99	72	16	463	2,933
<b>\$2,000-\$2,499</b>	697	805	365	129	103	56	7	348	2,510
<b>\$2,500 &amp; over</b>	1,922	2,673	1,055	344	367	183	34	724	7,302
<b>Total</b>	<b>8,966</b>	<b>8,396</b>	<b>3,577</b>	<b>1,079</b>	<b>913</b>	<b>946</b>	<b>172</b>	<b>4,701</b>	<b>28,750</b>

\*Options include those who elected a self-funded COLA option.

\*\*Option 4a includes 42 beneficiaries who are receiving a certain only benefit.

**Table 25**  
**Pensioners by Age and Option Code**

Average Age Male = 72.6      Average Age Female = 72.5      Average Age Total = 72.6

<b>Males</b>	<b>Option Code*</b>								
<b>Age Last Birthday</b>	<b>1</b>	<b>2</b>	<b>2P</b>	<b>3</b>	<b>3P</b>	<b>4a**</b>	<b>4b</b>	<b>5</b>	<b>Total</b>
<b>Under 50</b>	2	1	-	-	-	9	-	11	23
<b>50-54</b>	16	12	5	1	1	3	2	6	46
<b>55-59</b>	51	146	56	10	3	8	6	37	317
<b>60-64</b>	298	680	209	41	35	33	26	116	1,438
<b>65-69</b>	477	1,093	450	88	71	69	24	235	2,507
<b>70-74</b>	511	1,136	414	94	95	73	7	230	2,560
<b>75-79</b>	362	790	240	89	59	66	1	201	1,808
<b>80-84</b>	255	510	90	77	28	42	1	160	1,163
<b>85 &amp; over</b>	198	358	35	84	13	34	-	138	860
<b>Total</b>	<b>2,170</b>	<b>4,726</b>	<b>1,499</b>	<b>484</b>	<b>305</b>	<b>337</b>	<b>67</b>	<b>1,134</b>	<b>10,722</b>
<b>Females</b>									
<b>Age Last Birthday</b>	<b>1</b>	<b>2</b>	<b>2P</b>	<b>3</b>	<b>3P</b>	<b>4a**</b>	<b>4b</b>	<b>5</b>	<b>Total</b>
<b>Under 50</b>	1	3	-	-	-	12	-	28	44
<b>50-54</b>	25	9	7	2	2	3	3	22	73
<b>55-59</b>	190	145	76	16	17	14	7	71	536
<b>60-64</b>	920	671	440	98	118	59	42	295	2,643
<b>65-69</b>	1,598	1,094	701	156	191	123	35	644	4,542
<b>70-74</b>	1,473	838	550	136	148	157	14	677	3,993
<b>75-79</b>	1,074	478	234	86	90	108	2	620	2,692
<b>80-84</b>	767	230	57	44	31	64	1	566	1,760
<b>85 &amp; over</b>	748	202	13	57	11	69	1	644	1,745
<b>Total</b>	<b>6,796</b>	<b>3,670</b>	<b>2,078</b>	<b>595</b>	<b>608</b>	<b>609</b>	<b>105</b>	<b>3,567</b>	<b>18,028</b>
<b>Males &amp; Females</b>									
<b>Age Last Birthday</b>	<b>1</b>	<b>2</b>	<b>2P</b>	<b>3</b>	<b>3P</b>	<b>4a**</b>	<b>4b</b>	<b>5</b>	<b>Total</b>
<b>Under 50</b>	3	4	-	-	-	21	-	39	67
<b>50-54</b>	41	21	12	3	3	6	5	28	119
<b>55-59</b>	241	291	132	26	20	22	13	108	853
<b>60-64</b>	1,218	1,351	649	139	153	92	68	411	4,081
<b>65-69</b>	2,075	2,187	1,151	244	262	192	59	879	7,049
<b>70-74</b>	1,984	1,974	964	230	243	230	21	907	6,553
<b>75-79</b>	1,436	1,268	474	175	149	174	3	821	4,500
<b>80-84</b>	1,022	740	147	121	59	106	2	726	2,923
<b>85 &amp; over</b>	946	560	48	141	24	103	1	782	2,605
<b>Total</b>	<b>8,966</b>	<b>8,396</b>	<b>3,577</b>	<b>1,079</b>	<b>913</b>	<b>946</b>	<b>172</b>	<b>4,701</b>	<b>28,750</b>

\*Options include those who elected a self-funded COLA option.

\*\*Option 4a includes 42 beneficiaries who are receiving a certain only benefit.

**Table 26**  
**Pensions Awarded in 2019 by Option Code**

Average Age = 63.0

Males & Females	Option Code*								
Benefit Amount	1	2	2P	3	3P	4a**	4b	5	Total
Under \$200	20	12	6	2	1	3	2	43	89
\$200-\$399	44	28	18	5	1	5	7	40	148
\$400-\$599	43	36	19	2	3	6	6	38	153
\$600-\$799	40	31	12	3	0	4	7	33	130
\$800-\$999	33	45	11	7	1	3	6	15	121
\$1,000-\$1,499	74	79	34	9	10	4	3	57	270
\$1,500-\$1,999	42	60	23	4	5	5	4	44	187
\$2,000-\$2,499	31	43	20	9	2	1	1	35	142
\$2,500 & over	131	189	78	26	19	5	9	76	533
<b>Total</b>	<b>458</b>	<b>523</b>	<b>221</b>	<b>67</b>	<b>42</b>	<b>36</b>	<b>45</b>	<b>381</b>	<b>1,773</b>
Males & Females									
Age Last Birthday	1	2	2P	3	3P	4a**	4b	5	Total
Under 50	0	0	0	0	0	6	0	14	20
50-54	14	9	6	3	0	0	3	5	40
55-59	52	80	33	8	7	2	2	23	207
60-64	220	228	96	32	19	15	19	83	712
65-69	141	170	78	19	14	7	15	95	539
70-74	25	28	7	5	2	4	5	43	119
75-79	4	7	1	0	0	1	0	47	60
80-84	1	1	0	0	0	1	0	35	38
85 & over	1	0	0	0	0	0	1	36	38
<b>Total</b>	<b>458</b>	<b>523</b>	<b>221</b>	<b>67</b>	<b>42</b>	<b>36</b>	<b>45</b>	<b>381</b>	<b>1,773</b>

\*Options include those who elected a self-funded COLA option

\*\*Option 4a includes 10 beneficiaries who are receiving a certain only benefit.

## Table 27

### Retirees and Disabled Members by Service at Retirement and Years Since Retirement

(Average Monthly Benefit)

Average Service at Retirement = 19.9      Average Years Since Retirement = 11.4

Service at Retirement		Years Elapsed Since Retirement							Totals
		0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	
<b>Less than 5</b>	Count	280	264	215	149	79	77	92	1,156
	Avg. Benefit	\$3,063	\$290	\$253	\$292	\$2,056	\$163	\$138	\$446
<b>5-9</b>	Count	1,079	1,124	688	481	307	273	254	4,206
	Avg. Benefit	\$554	\$475	\$403	\$374	\$339	\$307	\$276	\$439
<b>10-14</b>	Count	1,171	949	573	485	389	286	242	4,095
	Avg. Benefit	\$976	\$864	\$746	\$627	\$631	\$589	\$498	\$788
<b>15-19</b>	Count	951	823	599	505	439	244	167	3,728
	Avg. Benefit	\$1,499	\$1,357	\$1,140	\$1,004	\$976	\$925	\$764	\$1,211
<b>20-24</b>	Count	955	920	583	502	375	184	113	3,632
	Avg. Benefit	\$2,087	\$1,996	\$1,671	\$1,409	\$1,340	\$1,253	\$1,126	\$1,754
<b>25-29</b>	Count	1,041	1,083	821	558	373	124	81	4,081
	Avg. Benefit	\$2,833	\$2,808	\$2,420	\$2,085	\$1,972	\$1,929	\$1,528	\$2,509
<b>30-34</b>	Count	909	1,044	629	457	288	155	52	3,534
	Avg. Benefit	\$3,772	\$3,602	\$3,196	\$2,754	\$2,658	\$2,737	\$2,209	\$3,328
<b>35 &amp; Over</b>	Count	745	493	197	97	60	58	8	1,658
	Avg. Benefit	\$4,848	\$4,432	\$3,937	\$3,346	\$3,232	\$3,198	\$2,475	\$4,400
<b>Totals</b>	Count	<b>7,131</b>	<b>6,700</b>	<b>4,305</b>	<b>3,234</b>	<b>2,310</b>	<b>1,401</b>	<b>1,009</b>	<b>26,090</b>
	Avg. Benefit	<b>\$2,170</b>	<b>\$1,995</b>	<b>\$1,668</b>	<b>\$1,383</b>	<b>\$1,295</b>	<b>\$1,121</b>	<b>\$710</b>	<b>\$1,754</b>

**Table 28****Retirees and Disabled Members by Year of Retirement**

January 1, 2020 Total = 26,090

Year of Retirement	Count	Year of Retirement	Count
Under 1961	-	1990	206
1961	-	1991	216
1962	-	1992	327
1963	-	1993	294
1964	-	1994	346
1965	-	1995	584
1966	-	1996	411
1967	-	1997	410
1968	-	1998	435
1969	-	1999	468
1970	-	2000	537
1971	1	2001	598
1972	1	2002	589
1973	1	2003	681
1974	5	2004	802
1975	6	2005	735
1976	6	2006	765
1977	14	2007	884
1978	19	2008	1,015
1979	21	2009	915
1980	28	2010	1,119
1981	38	2011	1,316
1982	36	2012	1,366
1983	44	2013	1,426
1984	62	2014	1,477
1985	79	2015	1,440
1986	103	2016	1,496
1987	183	2017	1,469
1988	175	2018	1,393
1989	179	2019*	1,369

\*May include retirements as of January 1, 2020

**Table 29**  
**Thirty Year Projected Benefit Payments**

<b>Year Ending December 31</b>	<b>Actives</b>	<b>Retirees*</b>	<b>Total</b>
<b>2020</b>	\$ 31,514,687	\$ 604,990,358	\$ 636,505,045
<b>2021</b>	56,321,348	601,098,812	657,420,160
<b>2022</b>	80,900,573	596,551,239	677,451,812
<b>2023</b>	105,754,930	591,403,892	697,158,822
<b>2024</b>	134,189,916	585,427,039	719,616,955
<b>2025</b>	163,048,316	578,384,435	741,432,751
<b>2026</b>	192,749,265	570,797,338	763,546,603
<b>2027</b>	222,703,485	562,572,513	785,275,998
<b>2028</b>	252,738,507	553,313,131	806,051,638
<b>2029</b>	282,973,936	543,699,415	826,673,351
<b>2030</b>	313,372,351	524,076,015	837,448,366
<b>2031</b>	344,074,344	512,964,019	857,038,363
<b>2032</b>	375,122,096	500,728,107	875,850,203
<b>2033</b>	406,527,843	487,285,201	893,813,044
<b>2034</b>	438,250,318	473,142,164	911,392,482
<b>2035</b>	470,487,423	458,141,996	928,629,419
<b>2036</b>	503,033,062	442,110,401	945,143,463
<b>2037</b>	535,466,850	425,351,361	960,818,211
<b>2038</b>	567,175,894	407,844,186	975,020,080
<b>2039</b>	598,220,284	389,670,821	987,891,105
<b>2040</b>	628,590,107	371,085,785	999,675,892
<b>2041</b>	657,727,465	351,839,834	1,009,567,299
<b>2042</b>	685,438,008	332,243,021	1,017,681,029
<b>2043</b>	711,328,441	312,281,876	1,023,610,317
<b>2044</b>	734,928,091	292,077,316	1,027,005,407
<b>2045</b>	756,341,580	271,951,291	1,028,292,871
<b>2046</b>	774,604,733	251,760,700	1,026,365,433
<b>2047</b>	789,601,291	231,917,821	1,021,519,112
<b>2048</b>	801,184,350	212,450,476	1,013,634,826
<b>2049</b>	809,192,857	193,463,430	1,002,656,287

\* Includes Disabled Members, Beneficiaries, and Deferred Vested Members. Retirement benefit payments for deferred vested members are assumed to commence at age 60 (age 65 for Tier 2).



## APPENDIX A

---

### SUMMARY OF ACTUARIAL ASSUMPTIONS AND METHODS

# Summary of Actuarial Assumptions and Methods

The following methods and assumptions were used in preparing the January 1, 2020 actuarial valuation report.

## 1. Valuation Date

The valuation date for any given year is January 1<sup>st</sup>, the first day of each plan year. This is the date as of which the actuarial present value of future benefits and the actuarial value of assets are determined.

## 2. Actuarial Cost Method

The actuarial valuation uses the Entry Age Normal (EAN) actuarial cost method, amortized as a level percentage of payroll. Under this method, the employer contribution rate is the sum of (i) the employer normal cost rate, and (ii) the rate that will amortize the unfunded actuarial accrued liability (UAAL).

- a. The valuation is prepared on the projected benefit basis, under which the present value, at the investment return rate assumed to be earned in the future (currently 7.00%), of each participant's expected benefit payable at retirement or death is determined, based on his/her age, service, sex and compensation. The calculations take into account the probability of a participant's death or termination of employment prior to becoming eligible for a benefit, as well as the possibility of his/her terminating with a service, disability, or survivor's benefit. Future salary increases are also anticipated. The present value of the expected benefits payable for the active participants is added to the present value of the expected future payments to retired participants and beneficiaries to obtain the present value of all expected benefits payable from the Fund on account of the present group of participants and beneficiaries.
- b. The employer contributions required to support the benefits of the Fund are determined using a level funding approach, and consist of a normal cost contribution and a unfunded accrued liability contribution.
- c. The normal cost contribution is determined using the "entry age normal" actuarial cost method. Under this method, a calculation is made to determine the average uniform and constant percentage rate of employer contribution which, if applied to the compensation of each new participant during the entire period of his/her anticipated covered service, would be required to meet the cost of all benefits payable on his/her behalf based on the benefits provisions applicable for the individual member.
- d. The unfunded accrued liability contributions are determined by subtracting the actuarial value of assets from the actuarial accrued liability. Amortization bases are established each year and amortized based on the Board's policy. The Board's policy consists of amortizing the unfunded liability as of January 1, 2018, over a closed 30 year period with each subsequent amortization base created as a result of year to year experience changes over individual 20 year closed periods. The current year amortization base is determined by taking the current unfunded liability less the outstanding amounts of prior year bases.

## Summary of Actuarial Assumptions and Methods (continued)

### 3. Actuarial Value of Assets

The actuarial value of assets is based on the market value of assets with a five-year phase-in of actual investment return in excess of (less than) expected investment income. Expected investment income is determined using the assumed investment return rate and the market value of assets (adjusted for receipts and disbursements during the year). The returns are computed net of investment expenses. An adjustment is made if the actuarial value is not within 20% of the Market Value. For any year following a year in which the 20% of market value adjustment was applied, the actuarial value is determined as if the adjustment was not applied in the previous year.

### 4. Economic Assumptions

#### a. Investment return

7.00% per year, compounded annually, composed of an assumed 2.25% inflation rate and a 4.75% net real rate of return. This rate represents the assumed return, net of investment expenses.

#### b. Salary increase rate

Service	Rate	Service	Rate
1	6.50%	14	3.50%
2	6.50%	15	3.25%
3	6.50%	16	3.25%
4	6.00%	17	3.25%
5	5.25%	18	3.25%
6	4.75%	19	3.00%
7	4.25%	20	3.00%
8	4.00%	21	2.75%
9	4.00%	22	2.75%
10	4.00%	23	2.75%
11	3.75%	24	2.75%
12	3.50%	25	2.50%
13	3.50%	25+	2.50%

#### c. Payroll growth rate

In the amortization of the unfunded actuarial accrued liability, payroll is assumed to increase 2.50% per year. This increase rate is solely due to the effect of inflation on salaries, with no allowance for future membership growth.

#### d. Cost-of-Living adjustment

No cost-of-living adjustment is assumed since the policy for providing the benefit requires Board approval to make the recommendation to the Joint Appropriations Committee and the funded level of the plan shows a cost-of-living requirement would not be permitted.

## Summary of Actuarial Assumptions and Methods (continued)

### 5. Demographic Assumptions

#### a. Mortality

Healthy Pre-Retirement Mortality:

RP-2014 Employee Mortality Table, fully generational, projected with Scale MP-2017

Males: No set back with a multiplier of 100%

Females: No set back with a multiplier of 100%

Healthy Post-Retirement Mortality:

RP-2014 Healthy Annuitant Mortality Table, fully generational, projected with Scale MP-2017

Males: No set back with a multiplier of 100%

Females: No set back with a multiplier of 88%

Disabled Mortality

RP-2014 Disabled Mortality Table, fully generational, projected with Scale MP-2017

Males: No set back with a multiplier of 100%

Females: No set back with a multiplier of 100%

Age	Pre-Retirement		Post-Retirement		Disabled	
	Projected to 2020 using Scale MP-2017					
	Male	Female	Male	Female	Male	Female
20	0.04%	0.02%	0.04%	0.01%	0.04%	0.02%
25	0.05%	0.02%	0.06%	0.03%	0.20%	0.09%
30	0.05%	0.02%	0.09%	0.06%	0.50%	0.24%
35	0.06%	0.03%	0.13%	0.10%	0.92%	0.45%
40	0.07%	0.04%	0.19%	0.14%	1.32%	0.68%
45	0.09%	0.06%	0.27%	0.18%	1.63%	0.90%
50	0.16%	0.11%	0.38%	0.23%	1.90%	1.14%
55	0.27%	0.17%	0.55%	0.32%	2.24%	1.44%
60	0.47%	0.25%	0.78%	0.47%	2.65%	1.73%
65	0.83%	0.36%	1.10%	0.70%	3.17%	2.05%
70	1.34%	0.60%	1.62%	1.07%	3.91%	2.67%
75			2.54%	1.74%	5.14%	3.87%
80			4.23%	2.93%	7.24%	5.83%
85			7.37%	5.14%	10.78%	8.73%
90			13.01%	9.14%	16.56%	12.86%
95			20.87%	15.23%	23.60%	18.94%
100			30.32%	23.24%	31.55%	27.12%

## Summary of Actuarial Assumptions and Methods (continued)

### b. Disability and Withdrawal

Age	Disability		Withdrawal	
			Ultimate	
	Male	Female	Male	Female
20	0.01%	0.01%	11.00%	10.00%
25	0.01%	0.01%	11.00%	10.00%
30	0.01%	0.01%	6.00%	6.00%
35	0.01%	0.01%	5.00%	5.00%
40	0.01%	0.01%	4.00%	5.00%
45	0.02%	0.02%	4.00%	5.00%
50	0.12%	0.05%	3.00%	4.00%
55	0.24%	0.12%	3.00%	4.00%
60	0.24%	0.24%	3.00%	4.00%

Withdrawal		
Service	First five years	
	Male	Female
1	22%	25%
2	18%	21%
3	14%	15%
4	13%	15%
5	13%	14%

### Retirement Rates

Age	Retirement	
	Unreduced	Reduced
<50	15.0%	1.0%
50	15.0%	0.5%
51	15.0%	0.5%
52	15.0%	0.5%
53	15.0%	0.5%
54	15.0%	0.5%
55	17.0%	1.0%
56	17.0%	1.0%
57	15.0%	1.0%
58	15.0%	1.0%
59	15.0%	2.5%
60	13.0%	2.5%
61	13.0%	2.5%
62	18.0%	2.5%
63	15.0%	2.5%
64	15.0%	2.5%
65	25.0%	
66	30.0%	
67	28.0%	
68	25.0%	
69	25.0%	
70	15.0%	
71	15.0%	
72	15.0%	
73	15.0%	
74	15.0%	
75	15.0%	
76	15.0%	
77	15.0%	
78	15.0%	
79	15.0%	
80+	100.0%	

## Summary of Actuarial Assumptions and Methods (continued)

### 6. Other Assumptions

- a. Percent married: 85.00% of employees are assumed to be married. (No beneficiaries other than the spouse assumed.)
- b. Age difference: Male members are assumed to be three years older than their spouses, and female members are assumed to be three years younger than their spouses.
- c. Percent electing annuity on death (when eligible): All of the spouses of vested, married participants are assumed to elect an annuity.
- d. Percent electing deferred termination benefit: Vested terminating members are assumed to elect a refund or a deferred benefit. It is assumed that 25% of active members who terminate with a deferred vested benefit will elect to have their contributions refunded.
- e. Assumed age for commencement of deferred benefits: Members electing to receive a deferred benefit are assumed to commence receipt at the first age at which unreduced benefits are available, which for this plan is age 60 (65 for Tier 2).
- f. No benefit amount data is available for members entitled to deferred benefits. The benefit is estimated using the final average compensation and service provided by WRS.
- g. There will be no recoveries once disabled. We assume all disabled members are totally disabled.
- h. No surviving spouse will remarry.
- i. Administrative expenses: Assumed to be the average of the prior two years, with each year projected at 2.5% to the valuation date.
- j. Pay increase timing: Beginning of (fiscal) year. This is equivalent to assuming that reported pay represents amount paid to members during the year ended on the valuation date.
- k. Decrement timing: Decrements of all types are assumed to occur mid-year.
- l. Eligibility testing: Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.
- m. Decrement relativity: Decrement rates are converted to probabilities in order to account for multiple decrements.
- n. Incidence of Contributions: Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in the report, and the actual payroll payable at the time contributions are made.
- o. Benefit Service: All members are assumed to accrue one year of service each year. Exact fractional service is used to determine the amount of benefit payable.

## APPENDIX B

---

### SUMMARY OF PLAN PROVISIONS

## Summary of Plan Provisions

<b>Covered Members</b>	Any full-time or regular part-time employee of an employer as defined under W.S. 9-3-402(a)(vii)
<b>Tier</b>	Members who join the State of Wyoming Retirement System by August 31, 2012 are in Tier 1, while members who join on or after September 1, 2012 are in Tier 2.
<b>Final Average Salary</b>	For Tier 1 member: employee's average annual salary for the highest paid three continuous years of service. For Tier 2 members: employee's average annual salary for the highest paid five continuous years of service.
<b>Service Retirement</b>	
Eligibility	Tier 1 members may retire upon normal retirement on the date he/she attains age 60 with four or more years of service while Tier 2 members may retire upon normal retirement on the date he/she attains age 65 with four or more years of service. All employees may also retire upon normal retirement on the date that the sum of the member's age and service is at least 85. Tier 1 members are eligible for a reduced benefit at age 50 with four or more years of service and Tier 2 members are eligible for a reduced benefit at age 55 with four or more years of service. All members are eligible for a reduced benefit at any age with 25 or more years of service.
Benefit	For Tier 1 member: 2.125% of employee's Final Average Salary for each year of credited service for the first 15 years of service credit plus 2.25% of Final Average Salary for any years of service credit exceeding 15 years. For Tier 2 members: 2.000% of employee's Final (5-year) Average Salary for each year of credited service.  This amount is reduced by 5.0% per year that the employee is under age 60 for Tier 1 and under age 65 for Tier 2. However, members retiring with a combined age and service of at least 85 receive an unreduced benefit. Employees hired prior to July 1, 1981 may be entitled to benefits earned under a different formula.
Vesting	Any employee who has left employment with four or more years of service, and who has not withdrawn accumulated contributions, is eligible to receive the above benefit or can elect to receive a lump-sum refund of employee contributions with interest. An employee who terminates with less than four years of service is only eligible for the lump-sum benefit.



## Summary of Plan Provisions (continued)

### Disability Benefit

Eligibility	Ten or more years of service.
Benefit	Service retirement benefit earned as of the date of disability, payable immediately.
Park Rangers	Effective March 5, 2015, for eligible peace officers as defined under W.S. 6-1-104(a)(vi)(P) whose disability is duty-related, the member shall be eligible immediately for a benefit of 62.5% of the member's final salary.

### Pre-retirement Death Benefit

Eligibility	No age or service requirements.
Benefit	A lump sum equal to two times the employee contributions with interest. If the employee is vested, the beneficiary can elect, in lieu of this lump sum, to receive a monthly annuity equal to the actuarial equivalent of the retirement benefit that would be due the employee.
Park Rangers	Effective March 5, 2015, for eligible peace officers as defined under W.S. 6-1-104(a)(vi)(P) whose death is duty-related, the member shall be eligible immediately for a benefit of 62.5% of member's final actual salary, payable to the surviving spouse plus 6% of the member's final actual salary for each unmarried child under age 18. Payment shall not exceed the member's final actual salary.

### Contributions

Employee	8.75% of salary.
Employer	8.87% plus an additional 1.0% for park rangers.
	Per Enrolled Act No. 65, both employee and employer contribution rates will increase 0.25% per year for the next two years starting July 1, 2020.
Interest	3.00% annually (0.0% for non-vested members).

### Cost-of-Living Improvements

W.S. 9-3-454 prohibits benefit changes, including cost-of-living increases, unless the funded ratio stays above 100% plus a margin for adverse experience throughout the life of the benefit change.



## Summary of Plan Provisions (continued)

### Optional Forms of Payment

	All options include the choice to elect a reduced benefit with a self-funded annual COLA of 1%, 2%, or 3% per year. COLAs commence on July 1 following the two-year anniversary of retirement.
Option 1	Monthly benefit for life with a lump-sum death benefit equal to the excess (if any) of the employee contributions with interest over the total benefits
Option 2	Monthly benefit for life. Upon death, 100% of the benefit continues to be paid to the beneficiary.
Option 2P	Monthly benefit for life. Upon death, 100% of the benefit continues to be paid to the beneficiary. Benefit reverts to Option 1 amount but without the cash refund feature upon beneficiary death.
Option 3	Monthly benefit for life. Upon death, 50% of the benefit continues to be paid to the beneficiary.
Option 3P	Monthly benefit for life. Upon death, 50% of the benefit continues to be paid to the beneficiary. Benefit reverts to Option 1 amount but without the cash refund feature upon beneficiary death.
Option 4a	Monthly benefit for life with a guarantee of 120 monthly payments
Option 4b	Monthly benefit for life with a guarantee of 240 monthly payments
Option 5	The largest possible monthly benefit payable for life with no lump-sum death benefit.

## APPENDIX C

---

### **RISKS ASSOCIATED WITH MEASURING THE ACCRUED LIABILITY**

## Risks Associated With Measuring the Accrued Liability and Actuarially Determined Contribution

The determination of the accrued liability and the actuarially determined contribution requires the use of assumptions regarding future economic and demographic experience. Risk measures, as illustrated in this report, are intended to aid in the understanding of the effects of future experience differing from the assumptions used in the course of the actuarial valuation. Risk measures may also help with illustrating the potential volatility in the accrued liability and the actuarially determined contribution that result from the differences between actual experience and the actuarial assumptions.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions due to changing conditions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period, or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. The scope of an actuarial valuation does not include an analysis of the potential range of such future measurements.

Examples of risk that may reasonably be anticipated to significantly affect the plan's future financial condition include:

1. Investment risk – actual investment returns may differ from the expected returns;
2. Asset/Liability mismatch – changes in asset values may not match changes in liabilities, thereby altering the gap between the accrued liability and assets and consequently altering the funded status and contribution requirements;
3. Contribution risk – actual contributions may differ from expected future contributions. For example, actual contributions may not be made in accordance with the plan's funding policy or material changes may occur in the anticipated number of covered employees, covered payroll, or other relevant contribution base;
4. Salary and Payroll risk – actual salaries and total payroll may differ from expected, resulting in actual future accrued liability and contributions differing from expected;
5. Longevity risk – members may live longer or shorter than expected and receive pensions for a period of time other than assumed;
6. Other demographic risks – members may terminate, retire or become disabled at times or with benefits other than assumed resulting in actual future accrued liability and contributions differing from expected.

The effects of certain trends in experience can generally be anticipated. For example if the investment return since the most recent actuarial valuation is less (or more) than the assumed rate, the cost of the plan can be expected to increase (or decrease). Likewise if longevity is improving (or worsening), increases (or decreases) in cost can be anticipated.

The computed contribution rate shown on Table 1A may be considered as a minimum contribution rate that complies with the Board's funding policy. The timely receipt of the actuarially determined contributions is critical to support the financial health of the plan. Users of this report should be aware that contributions made at the actuarially determined rate do not necessarily guarantee benefit security.



# Risks Associated With Measuring the Accrued Liability and Actuarially Determined Contribution

## Plan Maturity Measures

Risks facing a pension plan evolve over time. A young plan with virtually no investments and paying few benefits may experience little investment risk. An older plan with a large number of members in pay status and a significant trust may be much more exposed to investment risk. Generally accepted plan maturity measures include the following:

	<u>January 1, 2020</u>	<u>January 1, 2019</u>
Ratio of the market value of assets to total payroll	4.3	3.8
Ratio of actuarial accrued liability to payroll	5.6	5.5
Ratio of actives to retirees and beneficiaries	1.2	1.3
Ratio of net cash flows to market value of assets	-4%	-4%
Duration of the actuarial accrued liability	11.8	11.9

## Ratio of Market Value of Assets to Payroll

The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. For example, if the market value of assets is 4.0 times the payroll, a return on assets 5% different than assumed would equal 20% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in plan sponsor contributions as a percentage of payroll.

## Ratio of Actuarial Accrued Liability to Payroll

The relationship between actuarial accrued liability and payroll is a useful indicator of the potential volatility of contributions for a fully funded plan. A funding policy that targets a funded ratio of 100% is expected to result in the ratio of assets to payroll and the ratio of liability to payroll converging over time.

The ratio of liability to payroll may also be used as a measure of sensitivity of the liability itself. For example, if the actuarial accrued liability is 5.5 times the payroll, a change in liability 2% other than assumed would equal 11% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in liability (and also plan sponsor contributions) as a percentage of payroll.

## Ratio of Actives to Retirees and Beneficiaries

A young plan with many active members and few retirees will have a high ratio of active to retirees. A mature open plan may have close to the same number of actives to retirees resulting in a ratio near 1.0. A super-mature or closed plan may have significantly more retirees than actives resulting in a ratio below 1.0.

# Risks Associated With Measuring the Accrued Liability and Actuarially Determined Contribution

## Ratio of Net Cash Flow to Market Value of Assets

A positive net cash flow means contributions exceed benefits and expenses. A negative cash flow means existing funds are being used to make payments. A certain amount of negative net cash flow is generally expected to occur when benefits are prefunded through a qualified trust. Large negative net cash flows as a percent of assets may indicate a super-mature plan or a need for additional contributions.

## Duration of Actuarial Accrued Liability

The duration of the actuarial accrued liability may be used to approximate the sensitivity to a 1% change in the assumed rate of return. For example, duration of 10 indicates that the liability would increase approximately 10% if the assumed rate of return were lowered 1%.

## Additional Risk Assessment

Additional risk assessment is outside the scope of the annual actuarial valuation. Additional assessment may include scenario tests, sensitivity tests, stochastic modeling, stress tests, and a comparison of the present value of accrued benefits at low-risk discount rates with the actuarial accrued liability